

to Wang, Yamazaki '344, Yamazaki '720, Sugioka '508 and Sugioka '122. The Official Action rejects dependent claim 7 as obvious based on the combination of Yu, Yamazaki '344, Yamazaki '720 and Sugioka '122. The Official Action rejects dependent claim 11 as obvious based on the combination of Yu, Yamazaki '344, Yamazaki '720 and Sugioka '122. The Official Action rejects dependent claim 12 as obvious based on the combination of Yu, Wang, Yamazaki '344, Yamazaki '720 and Sugioka '122. The Applicant respectfully traverses the rejection because the Official Action has not made a *prima facie* case of obviousness.

As stated in MPEP §§ 2142-2144.04, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some reason to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. Independent claims 1 and 2 recite activating the second impurity region by a second laser beam. For the reasons provided below, Yu, Wang, Yamazaki '344, Yamazaki '720, Sugioka '508 and Sugioka '122, either alone or

in combination, do not teach or suggest the above-referenced features of the present invention.

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. The Official Action appears to be silent as to the feature of “activating the second impurity region by a second laser beam.” In any event, the Applicant respectfully submits that Yu, Wang, Yamazaki ‘344, Yamazaki ‘720, Sugioka ‘508 and Sugioka ‘122, either alone or in combination, do not teach or suggest the above-referenced features of the present invention. Since Yu, Wang, Yamazaki ‘344, Yamazaki ‘720, Sugioka ‘508 and Sugioka ‘122 do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained.

Furthermore, there is no proper or sufficient reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Yu, Wang, Yamazaki ‘344, Yamazaki ‘720, Sugioka ‘508 and Sugioka ‘122 or to combine reference teachings to achieve the claimed invention. MPEP § 2142 states that the examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. It is respectfully submitted that the Official Action has failed to carry this burden. While the Official Action relies on various teachings of the cited prior art to disclose aspects of the claimed invention and asserts that these aspects could be used together, it is submitted that the Official Action does not adequately set forth why one of skill in the art would combine the references to achieve the features of the present invention.

The test for obviousness is not whether the references “could have been” combined or modified as asserted in the Official Action, but rather whether the references should have been. As noted in MPEP § 2143.01, “The mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art” (emphasis in original). KSR International Co. v. Teleflex Inc., 550 U.S. \_\_\_, \_\_\_, 82

USPQ2d 1385, 1396 (2007). Thus, it is respectfully submitted that the standard set forth in the Official Action is improper to support a finding of *prima facie* obviousness.

Independent claims 1 and 2 recite that the first laser beam having a fundamental wave is oscillated with a pulse width of 1 femtosecond or more and 10 picoseconds or less. The Official Action concedes that “Yu fails to disclose ... the laser beam having a pulse width of 1 femtosecond to 10 picoseconds” (page 2, Paper No. 20090731). The Official Action relies on Sugioka ‘508 and Sugioka ‘122 to allegedly teach “using a femtosecond laser (abstract)” (page 3, *Id.*). The Official Action asserts that “the femtosecond laser can generate multiphoton absorption [0094 - from the child application] and using the fundamental wave laser would eliminate the need for non-linear optics” (*Id.*; emphasis added). The Applicant respectfully disagrees and traverses the above assertions in the Official Action.

The test for obviousness is not whether the references “could have been” combined or modified as asserted in the Official Action, but rather whether the references should have been. As noted in MPEP § 2143.01, “The mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art” (emphasis in original). KSR International Co. v. Teleflex Inc., 550 U.S. \_\_\_, \_\_\_, 82 USPQ2d 1385, 1396 (2007). Thus, it is respectfully submitted that the standard set forth in the Official Action is improper to support a finding of *prima facie* obviousness.

Sugioka teaches the use of a plurality of laser beams that pass through lenses so that they are focused and superposed inside of a transparent material (see paragraph [0029]). As a result, “a shape with a substantially perfect sphere” can be processed (see abstract). Also, Sugioka teaches that the smallest shape that can be processed has a dimension of 100 nm (see paragraph [0094]) in certain conditions when multiphoton absorption occurs (see paragraph [0093]). To obtain multiphoton absorption, Sugioka relies on the focalization and superposition of at least two laser beams.

That is, Sugioka appears to teach the use of a plurality of lasers to obtain multiphoton absorption and to perform a three-dimensional process in a transparent material, with a minimum dimension of 100 nm. Also, Sugioka appears to be concerned with forming a “substantially perfect sphere.” Further, the Applicant notes that Sugioka is silent concerning the nature of the process by which a shaped is obtained in the material.

In contrast, the present application discloses a method whereby only a single laser is used to perform a surface treatment on a semiconductor material to anneal the material while maintaining the treatment at a very shallow depth (migration distance of impurities of about 1 nm, as stated in paragraph [0081] of the pre-grant publication of the present application), which is clearly significantly less than the 100 nm limit disclosed in Sugioka.

Yu appears to be concerned with fabrication of a field effect transistor with a dual laser thermal anneal process.

The Applicant respectfully submits that the Official Action has not set forth a cogent line of reasoning establishing a *prima face* case as to why one of ordinary skill in the art at the time of the present invention would have modified Yu based on Sugioka. For example, it is not clear why one would apply a process concerned with forming a “substantially perfect sphere” in a transparent material having a minimum dimension of 100 nm (presumably, a sphere having a diameter of at least 100 nm) would have any reason to apply this laser to the semiconductor impurity regions of Yu. Although Yu does not disclose the exact dimensions of each of the structures illustrated, for example, in Figures 8-10, Yu is generally directed to improvements of a prior art “MOSFET 100 having submicron or nanometer dimensions.” It does not appear that a process used to form a substantially perfect sphere in a transparent material having a minimum dimension of 100 nm relates to the formation of a MOSFET (semiconductor material) having submicron or nanometer dimensions. Also, Sugioka’s laser process does not appear to relate in any discernible manner to surface laser treatments and

activation steps for semiconductor materials, which are presently claimed. As such, it is not clear why one of ordinary skill in the art at the time of the present invention would have had any reason to use Sugioka's femtosecond laser in the processes used to form the structures shown, for example, in Figures 8-10 of Yu.

Therefore, the Applicant respectfully submits that the Official Action has not provided a proper or sufficient reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Yu, Wang, Yamazaki '344, Yamazaki '720, Sugioka '508 and Sugioka '122 or to combine reference teachings to achieve the claimed invention.

In the present application, it is respectfully submitted that the prior art of record, either alone or in combination, does not expressly or impliedly suggest the claimed invention and the Official Action has not presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

For the reasons stated above, the Official Action has not formed a proper *prima facie* case of obviousness. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a) are in order and respectfully requested.


Regarding dependent claims 13 and 14, which recite "wherein a wavelength band of the fundamental wave is from red ray to near-infrared ray," although the Official Action has withdrawn the indefiniteness rejections of claims 13 and 14 under 35 U.S.C. § 112, second paragraph, the Official Action asserts the following: "the applicant has not provided evidence that one would understand 'near infrared'. The Applicant contends that the terms are widely used in literature and can be readily understood, but the applicant has failed to provide any of this as evidence. Therefore the Examiner understands that the 1064nm fundamental wavelength of the Nd:Yag laser is in the near infra red region" (page 6, *Id.*). In response, the Applicant notes that near infrared is a portion of the infrared spectrum contiguous to the red portion of the visible spectrum. Byrnes mentions a sub-division of the infrared spectrum in which the near infrared

region occupies the 0.75-1.4  $\mu\text{m}$  wavelength band (Byrnes, James, (2009), Unexploded Ordnance Detection and Mitigation. Springer. pp. 21-22. ISBN 9781402092527).

The Commissioner is hereby authorized to charge fees under 37 C.F.R. §§ 1.16, 1.17, 1.20(a), 1.20(b), 1.20(c), and 1.20(d) (except the Issue Fee) which may be required now or hereafter, or credit any overpayment to Deposit Account No. 50-2280.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,



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